National Institute of Environmental Health Sciences

Interaction between urbanization and climate variability amplifies watershed nitrate export in Maryland

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Abstract:

We investigated regional effects of urbanization and land use change on nitrate concentrations in approximately 1,000 small streams in Maryland during record drought and wet years in 2001-2003. We also investigated changes in nitrate-N export during the same time period in 8 intensively monitored small watersheds across an urbanization gradient in Baltimore, Maryland. Nitrate-N concentrations in Maryland were greatest in agricultural streams, urban streams, and forest streams respectively. During the period of record drought and wet years, nitrate-N exports in Baltimore showed substantial variation in 6 suburban/urban streams (2.9-15.3 kg/ha/y), 1 agricultural stream (3.4-38.9 kg/ha/y), and 1 forest stream (0.03-0.2 kg/ha/y). Interannual variability was similar for small Baltimore streams and nearby well-monitored tributaries and coincided with record hypoxia in Chesapeake Bay. Discharge-weighted mean annual nitrate concentrations showed a variable tendency to decrease/increase with changes in annual runoff, although total N export generally increased with annual runoff. N retention in small Baltimore watersheds during the 2002 drought was 85%, 99%, and 94% for suburban, forest, and agricultural watersheds, respectively, and declined to 35%, 91%, and 41% during the wet year of 2003. Our results suggest that urban land use change can increase the vulnerability of ecosystem nitrogen retention functions to climatic variability. Further work is necessary to characterize patterns of nitrate-N export and retention in small urbanizing watersheds under varying climatic conditions to improve future forecasting and watershed scale restoration efforts aimed at improving nitrate-N retention.

Source: Ask your librarian to help locate this item.

Resource Description

Communication:

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience:

audience to whom the resource is directed

Researcher

Exposure : ☑

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality

Extreme Weather Event: Drought, Flooding

Food/Water Quality: Chemical

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater, Urban

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content